

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s) : Markus GESK et al.
Serial No. : 10/552,281
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For : METHOD FOR PRODUCING AND SECURING AN
APERTURED DISK
Examiner : James S. Hogan
Art Unit : 3752
Confirmation No. : 2007

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

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Date: December 20, 2010
Signature: /Kevin Kambo/
Kevin Kambo

REPLY UNDER 37 C.F.R. § 1.116

SIR:

In response to the Final Office Action of September 30, 2010, for which a three-month response date expires on December 30, 2010, kindly reconsider the above-captioned application without prejudice as follows:

Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this paper.

Remarks begin on page 4 of this paper.

While no fees are believed to be due, the Commissioner is authorized, as appropriate and/or necessary, to charge any fees or credit any overpayment to **Deposit Account No. 11-0600.**

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

Claims 1 to 7. (Canceled).

8. (Currently Amended) A method for producing and securing an apertured disk for a fuel injector for a fuel-injection system of an internal combustion engine, the apertured disk having an opening contour which ensures a complete passage of a fluid, the method comprising:

- a) providing a flat, metallic sheet having a constant thickness;
- b) reducing a thickness in one region of the sheet by one of impressing and embossing to form a frustoconical depression in the sheet;
- c) after the reducing, introducing at least one spray-discharge opening in the region having reduced thickness;
- d) after the introducing, machining the sheet until an apertured disk having predefined outside dimensions is attained; and
- e) securing the apertured disk on a valve-seat member of the fuel injector in such a way that a lower end face of the valve-seat member delimits, along with the reduced-thickness region, an intake region of the apertured disk, and a vertical projection of the lower end face of the valve seat member onto an upper surface of the reduced-thickness region completely overlaps the at least one spray-discharge opening,

wherein the flat, metallic sheet retains a thickness of at least 0.2 mm in a region outside of the region having reduced thickness,

wherein the thickness is reduced in the region by 0.05 mm to 0.1 mm with the aid of one of impressing and embossing.

9. (Previously Presented) The method according to claim 8, wherein the sheet provided for the impressing is made of a material having a tensile strength of 500 to 700 N/mm² and a hardness of 160+/-15 HV.

10. (Previously Presented) The method according to claim 8, wherein a material thrown up by the impressing on a contact side of a stamping tool is distributed on the sheet by rolling.

11. (Previously Presented) The method according to claim 8, wherein the sheet provided for the embossing is made of a material having a hardness greater than 160 HV.

12. (Previously Presented) The method according to claim 8, wherein a material pushed out by the embossing on a bottom side of the sheet facing away from a contact side of an embossing tool is removed by grinding.

Claim 13. (Canceled).

14. (Previously Presented) The method according to claim 8, wherein the at least one spray-discharge opening is introduced by one of punching, eroding and laser drilling.

Claim 15. (Canceled).

REMARKS

I. Introduction

With the cancellation herein with prejudice of claim 13, claims 8 to 12 and 14 are pending in the present application. In view of the following remarks, it is respectfully submitted that all of the presently pending claims are allowable, and reconsideration is respectfully requested.

II. Rejection of Claims 8 to 14 Under 35 U.S.C. § 103(a)

Claims 8 to 14 were rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of U.S. Patent No. 6,039,271 ("Reiter"), U.S. Patent No. 6,405,946 ("Harata et al."), and U.S. Patent No. 4,494,898 ("Brownbill"). It is respectfully submitted that the combination of Reiter, Harata et al., and Brownbill does not render unpatentable the present claims for at least the following reasons.

As an initial matter, claim 13 has been cancelled herein without prejudice (the subject matter having been incorporated into independent claim 8), rendering moot the present rejection with respect to claim 13.

Claim 8 relates to a method for producing and securing an apertured disk for a fuel injector for a fuel-injection system of an internal combustion engine, the apertured disk having an opening contour which ensures a complete passage of a fluid, the method including, *inter alia*, providing a flat, metallic sheet having a constant thickness, wherein the flat, metallic sheet retains a thickness of at least 0.2 mm in a region outside of the region having reduced thickness. Claim 8 has been amended to recite the feature that the thickness is reduced in the region by 0.05 mm to 0.1 mm with the aid of one of impressing and embossing. Thus, the thickness of the inner region as compared to the outer edge region is reduced by 0.05 mm to 0.1 mm. By retaining a thickness of at least 0.2 mm in the outside region, the injector has excellent fatigue strength and long-term endurance.

In contrast, the combination of Reiter, Harata et al., and Brownbill fails to disclose, or even suggest, the feature that a flat, metallic sheet retains a thickness of at least 0.2 mm in a region outside of a region having reduced thickness. The only disclosure made by Reiter that concerns thickness is with respect to the valve seat body (16), which Reiter states "is approximately 0.8 mm to 1.5 mm thick." As is apparent from Figure 1 of Reiter, the valve seat body (16) is significantly thicker than the injection port disk (34) (which the Examiner considers to be the apertured disk of

the present claims). Thus, if the valve seat body (16) is approximately 0.8 mm to 1.5 mm thick, the injection port disk (34) must be thinner. Therefore, Reiter does not disclose, or even suggest, a thickness of **at least 0.2 mm** in a region outside of a region having reduced thickness, as presented in claim 8.

Harata et al. and Brownbill do not cure this deficiency. Harata et al. does not disclose the thickness of the plate (25) or how much thickness remains after the depression is formed. Brownbill is not concerned with a fuel injector, or an apertured disk having a thickness of at least 0.2 mm in a region outside of the region having reduced thickness.

In the Response to Arguments section, as well as on page 3, of the Final Office Action, the Examiner considers the previous amendment to be a result-effective variable that is obvious to one skilled in the art since the previous amendment “include what is presumed to be a **starting** metal thickness **before** any machining.” Similarly, the Examiner refers to “the **start** of the disc formation process” (*emphasis added*).

As an initial matter, applicants disagree with the Examiner’s characterization of this feature as a result-effective variable, and its use in the rejection. According to M.P.E.P. § 2144.05, “[i]t is well-settled that a particular parameter must first be recognized as a result-effective variable, *i.e.*, a variable which achieves a recognized result, *before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation.*” The Examiner does not allege anything about the *optimum or workable ranges of the variable or routine experimentation.*” Thus, the Examiner’s reliance on a result-effective variable is improper.

Furthermore, this contention by the Examiner is based apparently on a misapprehension or misunderstanding of the previous amendment. The claims were previously amended to recite “wherein the flat, metallic sheet **retains** a thickness of at least 0.2 mm in a region outside of the region having reduced thickness.” (*emphasis added*). That is, according to the present invention the metallic sheet **retains** a thickness of at least 0.2 mm in a region outside of the region having reduced thickness, *i.e.* even after application of the method steps according to the present invention. Thus, nowhere do any of the references disclose the **retention** of this thickness. Even if, *arguendo*, the **starting** thickness was recognized by these references as a result-effective variable, one of ordinary skill would still not have

related it to the retention of this thickness through routine experimentation, because the relationship itself has not been recognized. Thus, the disclosure of these references cannot be used as prior art to establish that the retention thickness is a result-effective variable.

Accordingly, it is respectfully submitted that the combination of Reiter, Harata et al., Brownbill does not render unpatentable claim 8 or dependent claims 9 to 14 for at least these reasons.

In view of the foregoing, withdrawal of this rejection is respectfully requested.

III. Conclusion

In light of the foregoing, Applicants respectfully submit that all pending claims are in condition for allowance. Prompt reconsideration and allowance of the present application are therefore earnestly solicited.

Respectfully submitted,

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/Clifford A. Ulrich/
By: Clifford A. Ulrich, Reg. No. 42,194 for:
Gerard A. Messina, Reg. No. 35,952

KENYON & KENYON LLP
One Broadway
New York, New York 10004
(212) 425-7200

CUSTOMER NO. 26646